BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

FILED
07/26/21
04:59 PM

Order Instituting Rulemaking Regarding Broadband Infrastructure Deployment and to Support Service Providers in the State of California.	Rulemaking 20-09-001

REPLY COMMENTS OF COMCAST PHONE OF CALIFORNIA, LLC (U-5698-C) ON ASSIGNED ADMINISTRATIVE LAW JUDGE'S RULING

Michael D. Hurwitz
Eric P. Schmidt
Jaclyn P. Rosen
Willkie Farr & Gallagher, LLP
1875 K Street, N.W., #100
Washington, DC 20006
Tel. (202) 303-1000
Email: mhurwitz@willkie.com
Email: eschmidt@willkie.com
Email: jrosen@willkie.com

Suzanne Toller
James W. Tomlinson
John Nelson
Davis Wright Tremaine LLP
505 Montgomery Street, Suite 800
San Francisco, CA 94111
Tel. (415) 276-6500
Email suzannetoller@dwt.com
Email jimtomlinson@dwt.com
Email johnnelson@dwt.com

For Comcast Phone of California, LLC

July 26, 2021

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REPLY COMMENTS OF COMCAST PHONE OF CALIFORNIA, LLC (U-5698-C) ON ASSIGNED ADMINISTRATIVE LAW JUDGE'S RULING

Comcast Phone of California, LLC (U-5698-C) ("Comcast") respectfully submits this reply to comments filed in response to the *Assigned Administrative Law Judge's Ruling* ("Ruling") issued May 28, 2021 in the above-captioned docket, and the ruling granting an extension of time to file reply comments dated July 7, 2021.

I. INTRODUCTION

The Ruling asks "whether Internet service providers (ISPs) are refusing to serve certain communities or neighborhoods within their service or franchise areas, a practice commonly called redlining," and whether such practices are "a systemic problem in California."[1] The answer in the record is overwhelmingly "no." As detailed in opening comments, high-speed broadband is widely available in California without regard to socioeconomic status, and cable ISPs have deployed and upgraded advanced broadband infrastructure throughout their service areas on a rapid and non-discriminatory basis.[2] Thanks in large part to decades of private investment, *95 percent* of

[1] Ruling at 1, 5.

[2] *See, e.g.,* Charter Comments at 2 ("[T]hanks to robust capital investments and technological innovations made by Charter and other broadband providers, 100 Mbps broadband service or better is now available to the vast majority of Californians, especially in urban areas."); Cox Comments at 4 (noting that "[t]he Commission's own data reflects that almost 95% of households in California have access to a 100 Mbps broadband service, with that percentage increasing to over 97% in urban areas"); California Cable & Telecommunications Association ("CCTA") Comments at 6 (estimating that, once build-out requirements

California households have access to fixed broadband at 100 Mbps download speeds, according to the Commission's own data.[3] And while challenges remain in increasing digital literacy and broadband adoption so that all Californians can benefit from the services available where they live, targeted government subsidies such as the federal Emergency Broadband Benefit and voluntary programs like Comcast's Internet Essentials are helping low-income consumers obtain the benefits of a home broadband connection.[4]

Parties that allege systemic redlining by ISPs either define the issue so broadly as to lose any reasonable meaning or rely on flawed analysis to attempt to prove discriminatory denial of service where none exists. Some improperly conflate broadband *availability* with a wide range of factors that may be relevant to broadband *adoption* but have little or nothing to do with ISPs' network build-out decisions.[5] Others disregard near-ubiquitous broadband availability by re-defining redlining in terms of a lack of multiple options.[6] Still others ignore intermodal

for both RDOF winning bidders and pending California Advanced Services Fund ("CASF") grants are completed, fewer than 100,000 households in California will remain unserved at 25/3 Mbps).

[3] *See* Comcast Comments at 2; Israel-Keating Decl. ¶ 27 (calculation based on CPUC data from Table 1).

[4] *See* Comcast Comments at 12 (noting that "since it launched in 2011, Internet Essentials has connected a cumulative total of more than 10 million people (including 1.4 million in California) to the Internet at home, most for the first time"). In addition, Comcast has enabled the $50 per month federal Emergency Broadband Benefit to be made available for all its broadband tiers—not just Internet Essentials—so that low-income families can apply this benefit to a range of high-speed broadband plans that meet their needs. *Id.* at 14.

[5] *See* Public Advocates Office ("Cal Advocates") Comments at 9-10 (suggesting that redlining should encompass "[s]ubstantial differences in broadband subscription rates in areas with differing socioeconomic statuses," as well as "pricing practices that make broadband less affordable, or marketing practices that under-promote broadband services in particular areas"); Next Century Cities Comments at 10 (arguing that an investigation of redlining should address not just the "availability of the underlying infrastructure necessary for service," but also "whether those who have access have the skills and resources needed to subscribe and use the service available").

[6] *See* TURN Comments at 1 (suggesting that "*digital redlining should be identified as occurring in areas where residents do not have two wireline broadband service providers that offer downstream broadband service speeds of at least 100 Mbps*") (emphasis in original); Communications Workers of America Comments at 10 (attempting to derive redlining practices from the fact that "more than 96 percent of

competition and actual customer usage patterns in favor of a subjective preference for fiber-to-the-home ("FTTH") technology and wasteful proposals to overbuild high-speed broadband networks that already serve the overwhelming majority of Californians.[7] In short, redlining is *not* a systemic problem in California, and it would not be productive or realistic for the Commission to embark on a formal "investigation" of this topic.[8] Instead, the Commission should return to the core purpose of this rulemaking by administering and refining programs within its jurisdiction to "accelerate the deployment of and access to quality, affordable internet for all Californians."[9]

Notably, even parties that claim redlining is a systemic problem in California rarely attribute such practices to Comcast. The lone exception is Cal Advocates, which submitted a "redlining analysis" of Comcast's California service area that purports to show "potential income discrimination in how [Comcast] deploys broadband service within its respective video franchise territory."[10] Comcast focuses these reply comments on responding to these baseless allegations,

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California households have access to either zero or only one cable offering," as opposed to service from multiple cable ISPs).

[7] *See* Joint Advocates Comments at 15-16 (asserting that "discrimination in 21st century access is primarily driven by the ISPs' decisions on where to deploy fiber within their network," and that "[t]he Commission's inquiry should focus on determining what type of infrastructure is being deployed" rather than the availability of service or even the range of speeds available to consumers). Notably, other consumer advocates do not share this singular focus on fiber deployment. *See* California Emerging Technology Fund ("CETF") Comments at 3 (recommending against "a fiber-only mandate as touted by others," because "[w]ired and wireless technologies each have its place in a geographically complex and large state like California, with mountainous, desert, valley, and coastal terrains").

[8] *See* CETF Comments at 8 (urging the Commission not to "expend its scarce resources on a redlining investigation, but instead more fruitfully focus on solutions"). Other commenters rightly note that the Commission lacks authority to adopt any regulatory remedy in this area. *See* Advanced Communications Law & Policy Institute Comments at 36 ("The role of state PUCs in the broadband space is limited, with significant legal precedent suggesting that state commissions possess little regulatory authority over this inherently interstate service."); *see also* CETF Comments at 8 (noting that even if an investigation were to conclude there is redlining, "the next issue is whether this Commission has jurisdiction to mandate a remedy, particularly as to broadband infrastructure, currently classified by the Federal Communications Commission as an 'information service'").

[9] OIR at 1.

[10] Cal Advocates Comments at 13 and Attachment A-2. After the close of business on July 20, Cal Advocates provided counsel for Comcast with "corrected" backup data ("Corrected Data") to the analyses

which begin with a false premise and misapply other statistical principles to reach a highly misleading result. The attached declaration of Drs. Mark Israel and Bryan Keating ("Israel-Keating Supplemental Declaration") thoroughly rebuts Cal Advocates' methodology and conclusions.[11] Notwithstanding Cal Advocates' erroneous claims, Comcast does not deny access to high-speed broadband to any individual or community on the basis of income, and there is nothing in the record that would credibly support such a finding.[12]

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in its opening comments, a week after Cal Advocates provided counsel for Comcast with a first set of backup data supporting its original analysis ("Original Data"). (Counsel for Comcast had requested all backup data from Cal Advocates on July 7.) The Corrected Data was not merely limited to revised backup data, however; it also included ***substantial revisions to the calculations and tables underlying Cal Advocates' allegations with respect to Comcast***. Although Cal Advocates has not submitted revised opening comments to correct these inaccuracies in the record—which tend to be corrections ***in Comcast's favor***, as shown below—Comcast nonetheless references and responds to the Corrected Data and resulting calculations herein as relevant. In all events, as the Israel-Keating Supplemental Declaration explains, the Cal PA analysis is fatally flawed and does not demonstrate that Comcast engages in redlining in California. (The Israel-Keating Supplemental Declaration also addresses the Corrected Data in an Appendix thereto.)

[11] *See* Israel-Keating Supplemental Declaration ¶ 15 ("[T]he analysis presented in the Cal PA report is flawed and highly misleading and does not establish that Comcast engages in redlining in California. Rather, it is simply an exercise in drawing unwarranted inferences from tiny variations in the data and spurious correlations and mistaking statistical significance based on large sample sizes for non-existent evidence of causation.").

[12] Cal Advocates also misses the mark with its assertion that "[f]or Internet plans available to low-income customers, such as Comcast's Internet Essentials and AT&T Access, the Greenlining [Institute report titled *On the Wrong Side of the Digital Divide*] underscores the inadequacy of the plans' slow data speeds for completing basic tasks such as submitting homework assignments." Cal Advocates Comments at 5. As detailed in Comcast's opening comments, Comcast has repeatedly increased the speeds offered with Internet Essentials over the past decade and currently offers 50/5 Mbps, as well as free digital literacy training in person and online. *See* Comcast Comments at 12-13; Thorpe-Lubneuski Decl. ¶¶ 4, 8. Far from offering "slow data speeds," Internet Essentials provides low-income households throughout Comcast's service area with reliable, high-speed connectivity—not just for "basic tasks," but for full participation in remote learning and other aspects of digital life. *See* Cartesian, Inc., US Broadband: Household Bandwidth Demand Study at 32 (Jul. 2021), https://www.cartesian.com/wp-content/uploads/2021/07/Cartesian_NCTA-US-Broadband-Household-Bandwidth-Demand-Study-July-2021.pdf (finding, in a test of real-world application bandwidth requirements, that a 50/5 Mbps connection fully supports a "mixed entertainment scenario" for a family of four, including one live game, one two-participant video call, one 4K video stream, and one HD video stream). This research also found that a 50/5 Mbps connection could support up to four simultaneous group video calls with five participants each. *See id.*

With respect to other issues in this proceeding, Comcast concurs with the opening comments of CCTA and aligns itself with the views expressed in CCTA's reply comments.

II. REPLY TO RESPONSES TO QUESTIONS

7. Are there other studies or analysis that parties wish to submit for the record in this proceeding?

As noted above, Cal Advocates proffers a "redlining analysis" of Comcast's California service area, which purports to show "potential income discrimination in how [Comcast] deploys broadband service within its respective video franchise territory."[13] This analysis is deeply flawed and misleading in multiple ways. As an initial matter, Cal Advocates' own belated substantial "correction" of this analysis—as provided on July 20, 2021 to counsel for Comcast but not yet submitted by Cal Advocates in the record[14]—demonstrates how unreliable the analysis is, producing corrections ranging from ***30 to 50 percent deviation*** from the original analysis in Cal Advocates' opening comments.[15] These glaring errors are compounded by the fact that Cal Advocates' original submission, while presented as econometric "analysis" with statistically meaningful conclusions, is unverified and lacks any claim that it was prepared by a qualified economics expert. For these reasons alone, Cal Advocates' analysis should be given no weight.

With respect to its substance, Cal Advocates states that its redlining analysis:

> used the geographic area delineated by each cable provider's video franchise territory, determined the census blocks within that franchise territory, matched each of those census blocks with maximum advertised download and upload broadband speeds using data from FCC Form 477, and finally matched each census block with Median Household Income (MHI) data from the U.S. Census.[16]

[13] Cal Advocates Comments at 13 and Attachment A-2.

[14] *See supra* n.10.

[15] For example, in its original analysis, Cal Advocates calculates an average "redlining indicator" for Comcast of 10 percent. In the Corrected Data, this calculation is reduced to ***5 percent (a 50 percent error)***. In its original analysis, Cal Advocates calculates a "t-Test" of 2.2. In the Corrected Data, this calculation is reduced to ***1.5 (a 32 percent error)***.

[16] Cal Advocates Comments at 13.

From that data, Cal Advocates calculates a "redlining indicator" that reflects "the difference between the total percentage of low-income households in the service area regardless of broadband availability and the percentage of households without broadband service . . . which are low-income."[17] As Drs. Israel and Keating explain, this analysis is meaningless as evidence that Comcast is refusing to serve any household or area based on income.[18] The "redlining indicator" developed by Cal Advocates is not a standard metric used by economists or statisticians. But even accepting Cal Advocates' calculations at face value, its analysis is still flatly wrong, as its Corrected Data show that:

- Only one in 40 households in Comcast's California footprint (2.55 percent) lacks access to Comcast Internet service. Even before considering income, the small number of unserved households does not indicate that Comcast systemically refuses to serve any type of household.[19]

- Almost 87 percent of the households in Comcast's California footprint without access to Comcast Internet service are *not* low-income. That leaves only ***one in 300, or less than one third of one percent*** that are both unserved by Comcast and low-income.[20]

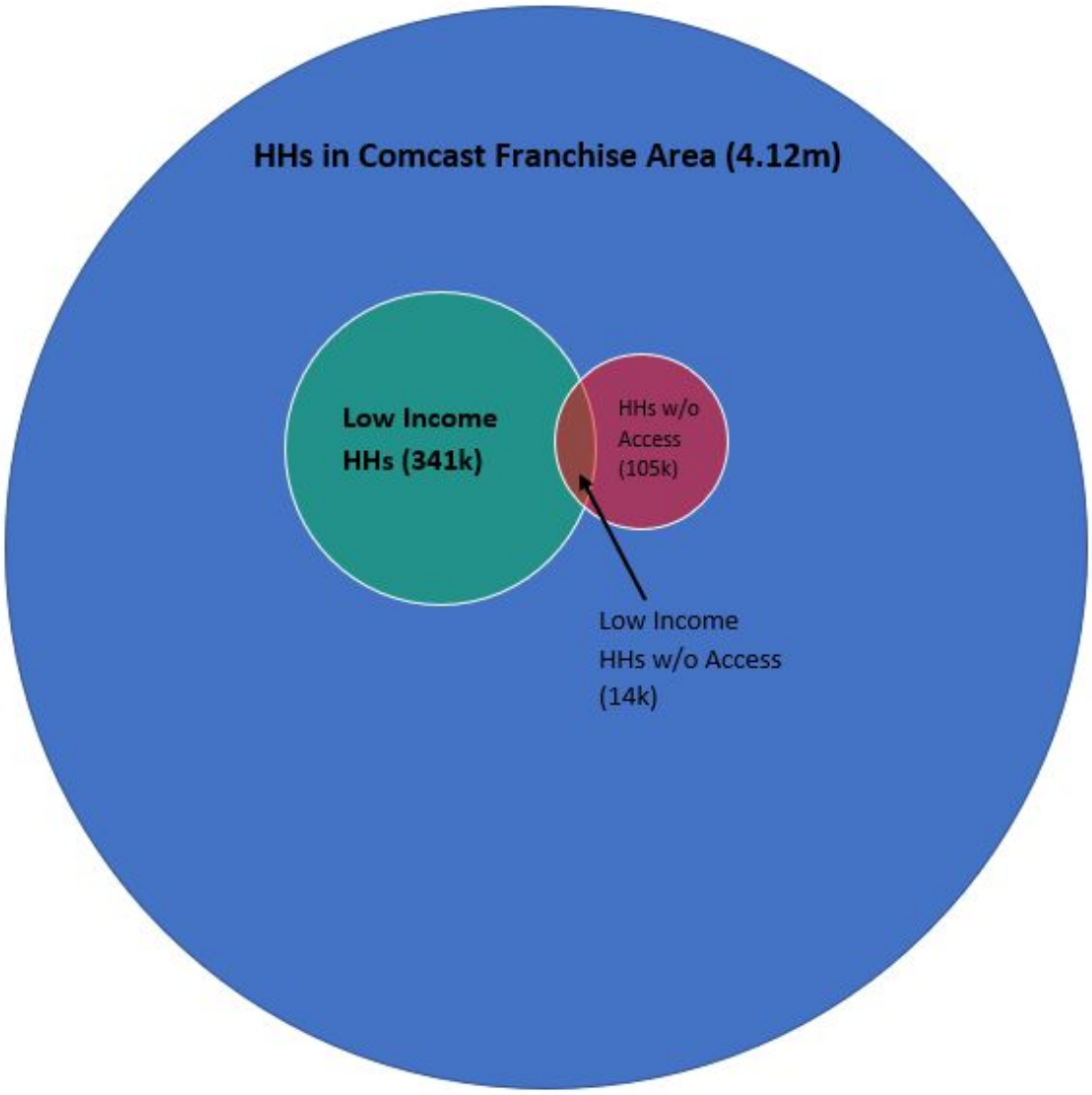
The chart below, drawn to scale using Cal Advocates' Corrected Data, illustrates the very small number of households in Comcast's California footprint that are both unserved and low-income, which by itself contradicts any claim of systemic redlining:

[17] *Id.*, Attachment A-2 at 3.

[18] Israel-Keating Supplemental Declaration ¶ 12.

[19] *Id.* ¶ 4.

[20] *Id.*, Appendix ¶ 4 (using Corrected Data). Based on the Original Data, this number was about one in 120, or less than one percent. *Id.* ¶ 4.



At the county level, Cal Advocates' analysis is even less supportive of any claim of redlining by Comcast. At this level of aggregation, many counties have only a negligible number of low-income households without access to broadband.[21] It is not surprising, then, that the "redlining indicator" in many of these counties reflects *the opposite* of redlining (i.e., according to Cal Advocates' logic and methodology, Comcast would appear to discriminate *in favor* of low-

[21] In Santa Barbara County, for example, the Corrected Data indicate that 53 out of 873 households without broadband are low-income. And in Placer County, zero out of 1,255 households without broadband is low-income.

income households).[22] Based on the Corrected Data, Cal Advocates' own analysis shows no redlining in ***17 out of 34 counties overall***, making the result effectively a coin flip.[23] This variation across counties, with many showing greater broadband access for low-income households than other households, indicates that Comcast is not redlining, but rather that other, unmodeled factors drive broadband deployment decisions.[24] In any event, the Corrected Data reflect only a ***1.5 percent difference*** in the overall probability of being served between the low-income and the non-low-income groups.[25] This also soundly refutes any claim of redlining: If Comcast were systemically denying service to low-income households, one would expect a much larger gap.[26]

Moreover, Cal Advocates' analysis suffers from the same "spurious correlation" problem as Table 1 of the Ruling.[27] Although Cal Advocates claims that its results are "statistically significant,"[28] that assertion is highly misleading. Statistical significance shows only that one can be sure that a *correlation* exists, but not whether such correlation shows any *causal relationship*, as opposed to spurious correlation due to both income and broadband deployment being linked to a third variable, such as population density.[29] As multiple parties have observed, disparities in broadband deployment reflected in the Ruling's Table 1 data are more strongly correlated with

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[22] Israel-Keating Supplemental Declaration ¶ 7.

[23] *Id.*, Appendix ¶ 7 (using Corrected Data). The Original Data found the opposite of redlining in 13 counties. *Id.* ¶ 7.

[24] *Id.*

[25] *Id.,* Appendix ¶ 11 (using Corrected Data). The Original Data purported to show a 2.2 percent difference in the probability of being served between the low-income and the non-low-income groups. *Id.* ¶ 11.

[26] *Id.* ¶ 11.

[27] *See* Comcast Comments at 21 (explaining that the relevant question in a properly framed analysis of redlining "is whether broadband availability depends on income *after controlling for all other factors that may affect deployment*, including those that are not within the control of ISPs") (emphasis in original).

[28] Cal Advocates Comments at 14.

[29] *See* Israel-Keating Supplemental Decl. ¶ 10.

density, remoteness, and other factors affecting the cost of network deployment than they are with household income.[30] Likewise, analysis of Cal Advocates' Corrected Data by Drs. Israel and Keating confirms that broadband availability is much more strongly correlated with population density than with income.[31] With a large enough sample size (such as all of the counties in Comcast's California service area) if each of two variables (i.e., deployment and income) are even very weakly correlated with a third factor (i.e., density), that is likely enough to make the correlation between them statistically significant *but raise no inference of causation*.[32]

Consequently, even in counties in which Cal Advocates claims to find redlining, that is most likely the result of statistical noise or spurious correlation. By way of example, in urban San Francisco County, the areas with the highest percentage of unserved households are industrial areas along the piers, commercial areas, parks, areas with mostly public buildings, and the downtown financial district. There also are small numbers of random neighborhoods that are partially served, but some of these neighborhoods are very affluent. These unserved "households" appear to be anomalies rather than evidence of any redlining of low-income areas.[33] And in more rural Stanislaus County, the areas with the highest proportion of unserved households are predominantly rural, lower-density census tracts. The City of Modesto is almost completely served, with the exceptions being some census tracts on the edge of the city bordering rural

[30] *See* CCTA Comments at 9; Charter Comments at 14-15 and Exhibit A, Brattle Group Study at 31; Comcast Comments at 20-21 and Israel-Keating Declaration ¶¶ 28-35; Cox Comments at 10-11; AT&T Comments at 3.

[31] Israel-Keating Supplemental Decl., Appendix ¶ 14 (using Corrected Data). This finding is true both when looking across all census tracts (0.134 correlation for density compared with 0.043 for income), and when calculating correlations for every county separately and then averaging (0.302 correlation for density and about zero average correlation for income). Using the Original Data, these figures were, respectively, 0.076 correlation for income (across all census tracts) and a *negative* average correlation for income (averaging the counties). *Id.* ¶ 14.

[32] *See id.* ¶ 12.

[33] *Id.* ¶ 8.

communities.[34] These examples show that population density and remoteness—not income—are the primary drivers of the extent to which locations are served. Accordingly, Cal Advocates' "redlining indicator" is meaningless as evidence of discrimination based on income.

For all these reasons, and as detailed further in the Israel-Keating Supplemental Declaration, the Commission should accord Cal Advocates' redlining analysis of Comcast no weight in this proceeding.

III. CONCLUSION

Comcast supports the goal of universal broadband access and has made extensive investments and efforts to ensure broadband availability and promote broadband adoption in low-income communities. But while remaining adoption challenges exist, it is not accurate or constructive to equate them with redlining. Notwithstanding the demonstrably flawed analysis of Cal Advocates and a few other parties, objective data show that high-quality broadband is widely available in California and do not support assertions that ISPs are systemically refusing to serve anyone. Based on the current record, a further Commission investigation would be unnecessary, impractical, and an unfortunate distraction from more effective measures to close the remaining digital divide. Instead, the Commission should focus its efforts on programs within its jurisdiction to fund broadband buildout in unserved areas and encourage adoption among Californians who do not currently subscribe.

[34] *Id.* ¶ 9.

Respectfully submitted,

By: / s / *Suzanne Toller*

Suzanne Toller
James W. Tomlinson
John Nelson
Davis Wright Tremaine LLP
505 Montgomery Street, Suite 800
San Francisco, CA 94111
Tel. (415) 276-6500
Email suzannetoller@dwt.com
Email jimtomlinson@dwt.com
Email johnnelson@dwt.com

For Comcast Phone of California, LLC

Michael D. Hurwitz
Eric P. Schmidt
Jaclyn P. Rosen
Willkie Farr & Gallagher, LLP
1875 K Street, N.W., #100
Washington, DC 20006
Tel. (202) 303-1000
Email: mhurwitz@willkie.com
Email: eschmidt@willkie.com
Email: jrosen@willkie.com

Dated: July 26, 2021

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SUPPLEMENTAL DECLARATION OF MARK A. ISRAEL AND BRYAN G. M. KEATING

1. We reviewed the Opening Comments of the Public Advocates Office ("Cal PA report"),[1] including Attachment A-2 ("Attachment").[2] We conclude that the analysis presented in this report and in the Attachment is flawed and does not establish that Comcast engages in redlining in California. More generally, nothing in the Cal PA report changes any of the conclusions from our previous declaration.[3]

2. Before addressing the substance of Cal PA's analysis, we observe that Cal PA has not provided sufficient backup information to replicate its analysis. Cal PA's written description of its analysis is vague.[4] Cal PA has provided the processed data that it used to create its tables, but not the raw data nor the computer code necessary to replicate the processed data, which makes it impossible to diagnose the critical decisions it made in analyzing the data or how those decisions affect the results.[5] Nevertheless, a few major problems are evident even taking the results at face value without being able to verify the accuracy of the reported metrics or assess the data processing decisions made.

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1 *See* Public Advocates Office ("Cal PA"), Comments.

2 Titled Comcast Cable Communications Management, LLC - Video Franchise Territory Broadband Redlining Analysis 2020.

3 Comcast Comments, Declaration of Mark A. Israel and Bryan G. M. Keating (July 2, 2021). Our qualifications were provided in that declaration.

4 For example, it does not describe how it treated census blocks that are partially covered by Comcast.

5 Cal PA's backup data came in two tranches. First, on July 13, 2021, Cal PA supplied counsel for Comcast with backup data for Cal PA's original analysis in the Attachment, and we used that backup data for the calculations in the body of this declaration ("Cal PA Backup Data"). On July 20, 2021, Cal PA supplied counsel for Comcast with "corrected" backup data and different results based on such data, in a file named "Comcast_franchiseanalysis_corrected.xlsx" ("Cal PA Corrected Backup Data"). We set forth revised calculations using this "corrected" data in the Appendix (with revised calculations underlined). As shown therein, Cal PA's corrected data only reinforces our conclusion that Cal PA's analysis does not support any finding of redlining by Comcast.

3. First, as shown in Table 3 of Cal PA's report, only one in 40 households in Comcast California footprint (2.5 percent) lacks access to Comcast internet service (per Cal PA's definition). Even before considering income, the number of unserved households is *de minimis* and does not indicate that Comcast systemically underserves any types of household. Far from denying service to low-income customers, Comcast provides nearly complete coverage to all households within its footprint in the state.

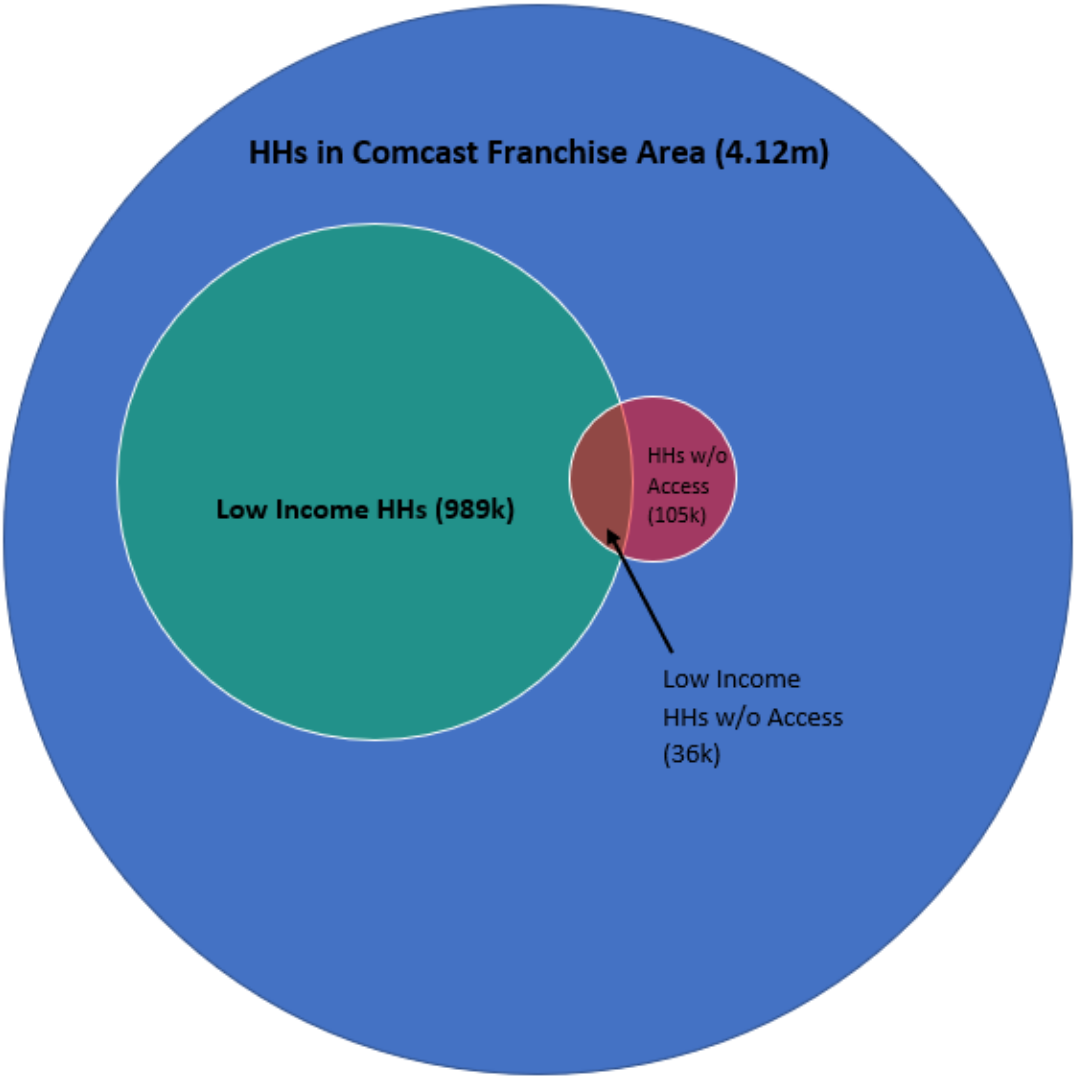
4. Moreover, as Table 1 of the Attachment shows, almost two thirds (65%) of the households without access to Comcast Internet service in Comcast's footprint are *not* low income according to Cal PA's own definition. That leaves one third of 1/40 households that are both unserved by Comcast and low income, i.e., about one in 120 total households, meaning less than one percent. Again, such small percentages of unserved low-income households are decidedly inconsistent with any claim that Comcast is systemically denying coverage to low-income households.

5. The chart below, *drawn to scale* using Cal PA's data, illustrates the small percentage of households in Comcast's footprint that are both unserved and low income. The figure also shows that:

- the percentage of Comcast's California households without access to Comcast broadband (red circle) is very small compared to the total number of households in Comcast's California footprint (blue circle);
- the vast majority of low-income households in Comcast's California footprint (green circle) do have access to broadband; and
- the majority of households without access to broadband in Comcast's CA footprint are not low income.

6. Put simply, the obvious conclusion from the data Cal PA relies on is that Comcast does not deny access to broadband to low-income California consumers, but rather serves the

overwhelming majority of them, like it serves the overwhelming majority of all Californians within its footprint.



7. At the county level, the main unit of Cal PA's analysis, the analysis is even less supportive of any claim of redlining by Comcast. At this level of aggregation, many of the counties have only a negligible number of low-income households that do not have access to broadband service, as demonstrated in Table 1 of the Attachment. It is not surprising that Cal

PA finds that many of these counties – 13 in total - have the *opposite* of redlining (i.e., according to Cal PA's logic and methodology, Comcast would appear to discriminate in these cases *in favor* of low-income households). This variation across counties, with many counties showing greater broadband access for low-income households than other types of households, indicates that Comcast is not denying service to low-income households, but rather that other, unmodeled factors drive broadband deployment decisions, and that any associated spurious correlation with income can go either way, depending on the county.

8. Even in counties where Cal PA claims to find redlining, the figures may simply result from statistical noise or spurious correlation. Take, for example, San Francisco County, the most urban county in Comcast's footprint in California. We observe that the areas with the highest percentage of unserved households are industrial areas along the piers, commercial areas, parks, areas with mostly public buildings, and, perhaps surprisingly, also the financial district. There are also a very small numbers of random neighborhoods that are partially served, but some of these neighborhoods are very affluent. These unserved households appear to be anomalies rather than evidence of a systematic attempt to redline particular poor areas.

9. We also analyzed patterns of service in rural counties. Taking Stanislaus County as an example, it is clear that the tracts with the highest proportion of unserved households are predominantly the rural, lower-density census tracts. The City of Modesto is almost completely served, with the exceptions being some areas on the edge of town bordering rural communities. Again, geography and density, not income, seem to be the drivers that primarily determine the extent to which a location is served.

10. Although Cal PA claims that its results are "statistically significant," this claim is highly misleading. Finding statistical significance does not imply that Cal PA's findings are

economically meaningful. It shows that the data reveal enough *correlation* to be sure it exists, but nothing about whether such correlation shows any causal relationship, as opposed to spurious correlation due to both income and broadband deployment being linked to a third variable, such as population density. Put simply, correlation is not causation.

11. Turning to the results in more detail, the first thing to note is that, according to Table 2 in Cal PA's Attachment, there is a very small difference in the probability of being served between the low-income and the non-low-income groups: only 2.2%. This fact, by itself, refutes any claim of redlining: If Comcast were systemically redlining, one would expect a much bigger gap. In contrast, a gap of +/- 2% is likely to occur because neither broadband deployment nor the neighborhoods where people live are random: Broadband is deployed more completely where population density and other factors make it less costly to do so, and these area-specific cost factors (including population density) may be correlated with the income of local residents, in different ways in different places, creating the varying pattern seen in different counties and the small overall 2.2% "gap."

12. The fact that Cal PA finds statistically significant correlation does not change this conclusion. Rather, it is an artifact of the large sample size (across all counties) and the fact that Cal PA's analysis does not attempt to ascertain a causal relationship between income and broadband deployment. With such a large sample size, if each of the two variables are even very weakly correlated with a third factor, that is likely enough to make the correlation between them statistically significant.[6] But no meaningful causal inference can possibly be drawn from such

[6] See, for example, Peter Kennedy, *A Guide to Econometrics*, 4th Edition, The MIT Press Cambridge, Massachusetts, p. 64 ("For a number of reasons, test of significance can sometimes be misleading… One of the of the more interesting problems in this respect is the fact that almost any parameter can be found to be significantly different from zero if the sample size is sufficiently large…. Too large a sample size might cause difficulties in interpreting the usual tests

correlation.[7] As explained at length in our previous declaration, there are many factors, such as remoteness and population density, that are correlated with household income and also with the likelihood of having broadband access. The presence of such factors is enough to create a small gap of 2.2% in deployment between the groups and to make such a gap statistically significant. But as we explained in our previous declaration, such factors have nothing to do with redlining.

13. To confirm our concerns about Cal PA's analysis, we used its exact data to calculate, for each county, two other correlations across census tracts in the county: (i) the correlation between the percentage of low-income households and the percentage of unserved households (both variables were created by Cal PA), and (ii) the correlation between the census tract's population density (calculated by dividing population by area) and the percentage of served households (the complement to the percentage unserved). The results are presented in Table 1 below. We also added to the table a simple average of these correlations across the counties as well as correlations across all census tracts regardless of county (this is displayed in the last row labelled "Total").

14. The results are clear: Population density is much more correlated with broadband access than income is. This is true both when looking across all census tracts: 0.134 correlation for the former compared with 0.076 for the latter, and when calculating these correlations for every county separately and then averaging: we find an average correlation of 0.302 for population density and a *negative* average correlation for income.

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of significance…. One must ask if the magnitude of the coefficient in question is large enough for its explanatory variable to have a meaningful (as opposed to "significant") influence on the dependent variable").

[7] An often-used example for misinterpreting correlation as causation is that observing that people taking aerobics classes have a higher average BMI than the general population does not mean aerobics increases your BMI.

15. In sum, the analysis presented in the Cal PA report is flawed and highly misleading and does not establish that Comcast engages in redlining in California. Rather, it is simply an exercise in drawing unwarranted inferences from tiny variations in the data and spurious correlations and mistaking statistical significance based on large sample sizes for non-existent evidence of causation.

Table 1: Correlations between % of Unserved Households, Income, and Population Density

		% of Total Households that are:		Correlation between:	
County	**Population Density**	**Low Income**	**Unserved**	**% of Low Income HHs - % of Unserved HHs**	**Population Density - % of Served HHs**
Alameda	2,242	14.56%	1.92%	0.030	0.063
Amador	83	28.78%	1.49%	-0.072	0.105
Butte	183	59.75%	1.52%	-0.220	0.415
Calaveras	51	36.02%	3.55%	0.228	-0.118
Contra Costa	1,990	17.02%	1.43%	-0.020	0.122
El Dorado	122	14.78%	5.14%	-0.167	0.379
Fresno	501	53.85%	3.77%	-0.131	0.427
Glenn	24	79.61%	11.01%	-0.510	0.604
Kings	120	50.14%	6.49%	0.157	0.532
Madera	162	52.78%	5.04%	-0.505	0.575
Marin	655	4.88%	0.67%	-0.032	0.073
Mendocino	67	47.32%	4.66%	-0.217	0.546
Merced	161	52.95%	4.12%	0.140	0.478
Monterey	528	28.88%	2.94%	-0.080	0.143
Napa	284	12.90%	4.21%	-0.018	0.354
Nevada	208	39.53%	8.60%	-0.536	0.817
Placer	3,150	16.80%	2.56%	-0.135	0.022
Sacramento	2,147	36.66%	2.25%	0.142	0.087
San Francisco	21,076	10.79%	1.03%	0.225	0.008
San Joaquin	605	43.18%	2.14%	0.133	0.248
San Mateo	2,005	3.94%	0.44%	-0.045	0.012
Santa Barbara	242	30.45%	1.35%	-0.220	0.310
Santa Clara	3,944	4.75%	2.56%	0.214	0.112
Santa Cruz	501	9.09%	2.08%	0.332	-0.054
Solano	647	21.11%	3.34%	0.133	0.215
Sonoma	327	14.54%	2.09%	-0.035	0.347
Stanislaus	385	39.96%	7.08%	-0.020	0.366
Sutter	324	38.79%	4.13%	-0.304	0.452
Tulare	584	44.37%	6.42%	0.093	0.509
Tuolumne	39	41.38%	5.34%	0.187	0.628
Yolo	408	29.89%	1.96%	0.094	0.398
Yuba	174	54.12%	5.52%	-0.566	0.496
Average of counties	*1,265*	*33.54%*	*3.38%*	*-0.054*	*0.302*
Total	*550*	*24.20%*	*2.54%*	*0.076*	*0.134*

Source: Cal PA Backup Data; 2021 Census Bureau Planning Database

Notes:

[1] Population estimates are based on the ACS 2015-2019 estimates.

[2] Low-income households have an income below $35,000.

[3] Correlations are calculated across all census tract within a county.

[4] Counties with less than three tracts are omitted from the table (Colusa, San Luis Obispo, and Tehama).

[5] “Average of counties” is a simple average of the column above.

[6] “Total” correlations are calculated across all tracts regardless of county.

APPENDIX: CALCULATIONS USINGS CAL PA'S CORRECTED DATA

Revised calculations in paragraph 4:

- 13 out of 15 (or 87%) of the households without access to Comcast Internet service in Comcast's footprint are not low income according to Cal PA's definition.
- That leaves one in 300 households that are both unserved by Comcast and low income, meaning less than one third of one percent.

Revised calculations and text in paragraph 7:

- It is not surprising that Cal PA finds that many of these counties – 15 out of a total of 34 – have the *opposite* of redlining (two others have a correlation of zero). I.e., according to Cal PA's logic and methodology, Comcast would appear to discriminate in almost half the counties *in favor* of low-income households. Of course, we are not suggesting that Comcast in fact does that. Our point is that if one suspects a coin is biased in favor of heads, say, it is illogical to toss it over and over and just count the heads occurrences while ignoring the tails. If about half come up heads and half come up tails, the conclusion has to be that the coin is not biased.

Revised calculations in paragraph 11:

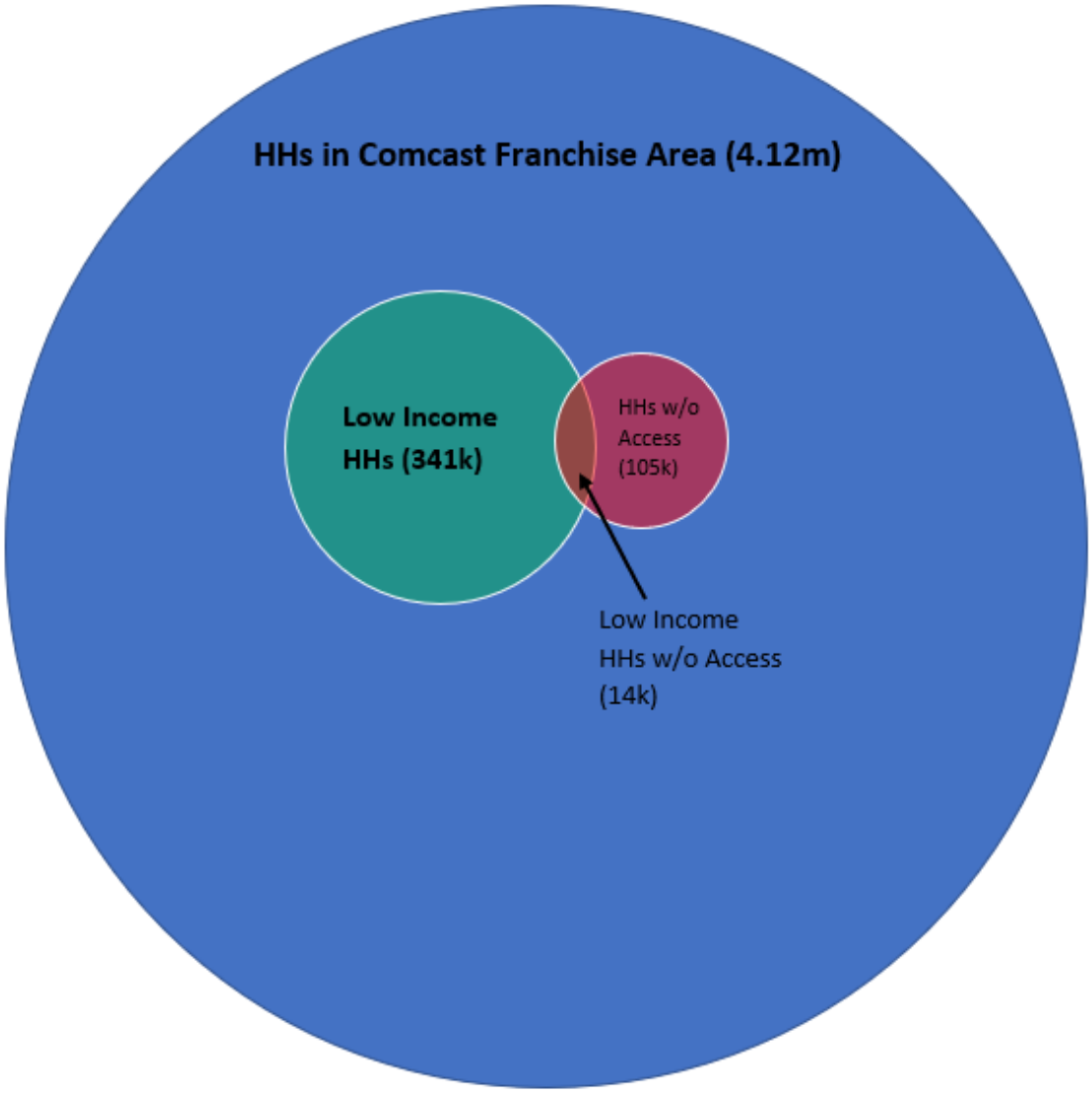
- Turning to the results in more detail, the first thing to note is that, according to Table 2 in Cal PA's Attachment, there is a very small difference in the probability of being served between the low-income and the non-low-income groups: only 1.5%.
- In contrast, a gap of +/- 1.5% is likely to occur because neither broadband deployment nor the neighborhoods where people live are random: Broadband is deployed more completely where population density and other factors make it less costly to do so, and these area-specific cost factors (including population density) may be correlated with the

income of local residents, in different ways in different places, creating the varying pattern seen in different counties and the small overall 1.5% "gap."

Revised calculations in paragraph 14:

- This is true both when looking across all census tracts: 0.134 correlation for the former compared with 0.043 for the latter, and when calculating these correlations for every county separately and then averaging: we find an average correlation of 0.302 for population density and about zero average correlation for income.

Revised Venn diagram:



Revised Table 2: Correlations between % of Unserved Households, Income, and Population Density

		% of Total Households that are:		Correlation Between:	
County	**Population Density**	**Low Income**	**Unserved**	**% of Low Income HHs - % of Unserved HHs**	**Population Density - % of Served HHs**
Alameda	2,242	3.76%	1.93%	0.024	0.063
Amador	83	15.93%	1.49%	-0.153	0.105
Butte	183	23.08%	1.52%	0.065	0.415
Calaveras	51	6.67%	3.53%	0.482	-0.117
Contra Costa	1,990	4.27%	1.43%	-0.051	0.123
El Dorado	122	3.17%	5.18%	-0.107	0.380
Fresno	501	26.87%	3.77%	-0.141	0.427
Glenn	24	9.84%	11.10%	0.428	0.603
Kings	120	12.09%	6.51%	-0.210	0.532
Madera	162	22.05%	5.08%	-0.242	0.575
Marin	655	0.56%	0.68%	-0.026	0.073
Mendocino	67	16.96%	4.66%	-0.245	0.547
Merced	161	19.25%	4.16%	0.059	0.479
Monterey	528	3.77%	2.94%	-0.081	0.143
Napa	284	0.05%	4.21%	0.084	0.352
Nevada	208	15.60%	8.55%	-0.516	0.817
Placer	3,150	1.71%	2.56%	-0.067	0.022
Sacramento	2,147	12.12%	2.25%	0.116	0.087
San Francisco	21,076	7.63%	1.03%	0.199	0.009
San Joaquin	605	14.26%	2.15%	-0.030	0.248
San Mateo	2,005	0.00%	0.44%	0.000	0.012
Santa Barbara	242	8.19%	1.36%	-0.046	0.310
Santa Clara	3,944	1.44%	2.56%	0.319	0.112
Santa Cruz	501	3.52%	2.10%	0.638	-0.053
Solano	647	2.54%	3.35%	0.027	0.216
Sonoma	327	2.89%	2.08%	-0.012	0.345
Stanislaus	385	12.38%	7.09%	0.060	0.366
Sutter	324	13.69%	4.09%	-0.163	0.452
Tulare	584	10.83%	6.40%	-0.127	0.508
Tuolumne	39	9.25%	5.34%	0.022	0.628
Yolo	408	21.31%	1.96%	0.164	0.398
Yuba	174	26.67%	5.60%	-0.308	0.498
Average of counties	1,373	*10.39%*	*3.66%*	*0.005*	*0.302*
Total	*550*	*8.28%*	*2.54%*	*0.043*	*0.134*

Source: Cal PA Corrected Backup Data; 2021 Census Bureau Planning Database

Notes:

[1] Population estimates are based on the ACS 2015-2019 estimates.

[2] Percentages are calculated using total households (regardless of availability) as the denominator.

[2] Low-income households are classified as those that fall below $35,000 median household income.

[3] Correlations are calculated across census tract level within a county.

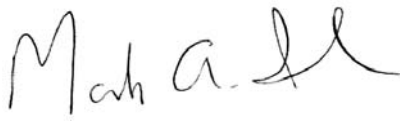
[4] Counties with less than three tracts are omitted from the table. These included Colusa, San Luis Obispo, and Tehama.

[5] Average of counties is a simple average of the column above.

[6] Total correlations were calculated across all the tracts regardless of county.

I declare under penalty of perjury under the laws of the State of California that, to the best of my knowledge, the foregoing is true and correct.

Executed on July 26, 2021 at Washington, DC.



Dr. Mark A. Israel, Compass Lexecon

I declare under penalty of perjury under the laws of the State of California that, to the best of my knowledge, the foregoing is true and correct.

Executed on July 26, 2021 at Washington, DC.

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Dr. Bryan G. M. Keating, Compass Lexecon